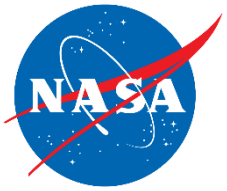

A case against WFIRST CGI polarization aberration compensation

John Krist

Jet Propulsion Laboratory, California Inst. of Technology

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Numerical Modeling

- Uses most recent testbed HLC design (HLC 20180925) for current WFIRST pupil
  - 10% bandpass centered at 575 nm
- Uses full system model with surface errors on each optic
- Uses polarization aberrations for Phase B TOMA computed by Jim McGuire using Code V
- EFC run for each polarization case
  - no polarization errors
  - X polarization
  - All polarizations
- No modelling uncertainty factors applied

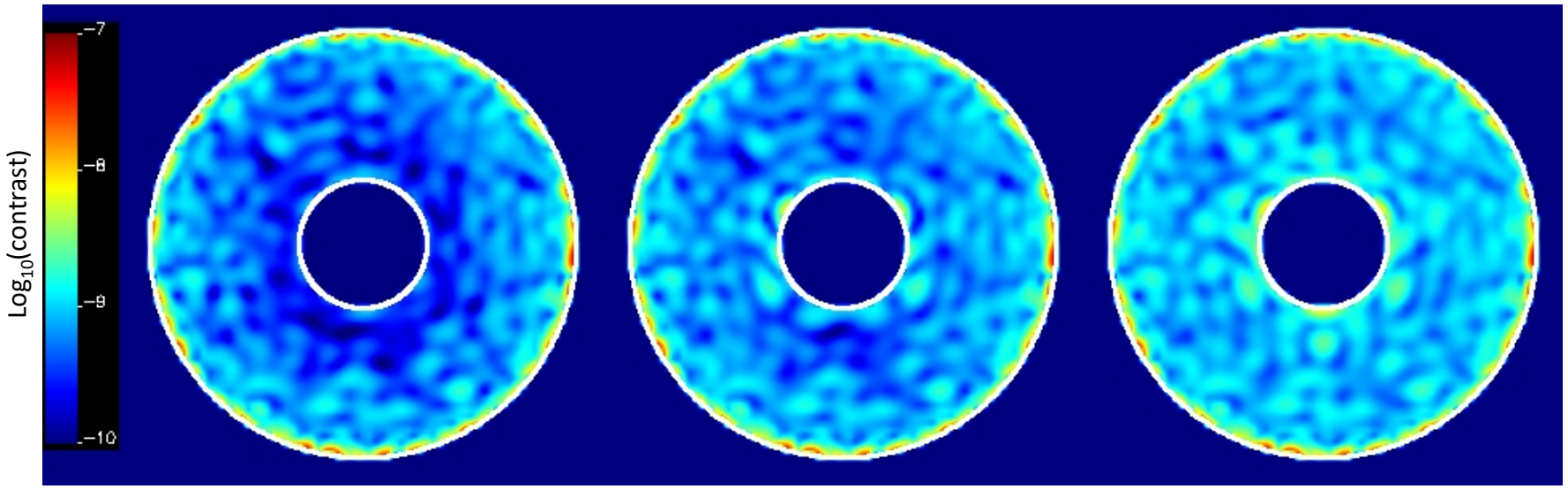
HLC 20180925 (10%, λ_c=575 nm)

Each result is after running EFC; no jitter

No polarization aberrations

Single polarization

All polarizations (no polarizer)

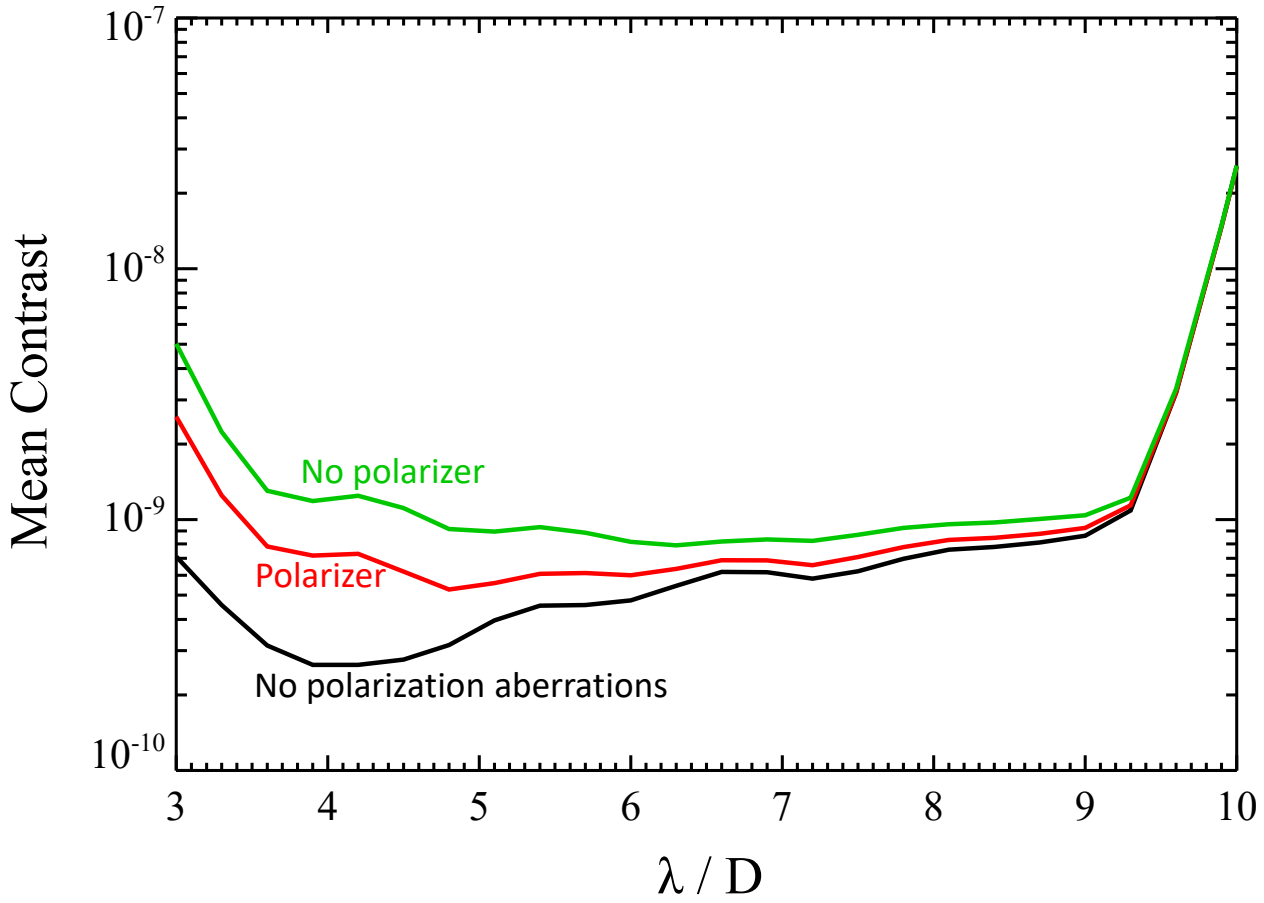


Circles are r = 3 & 10 λ/D

	3 – 4 λ/D	4 – 9 λ/D
No pol errors	0.4 x 10^{-9}	0.6 x 10^{-9}
Single polarization	1.2 x 10^{-9}	0.8 x 10^{-9}
No polarizer	2.2 x 10^{-9}	1.0 x 10^{-9}

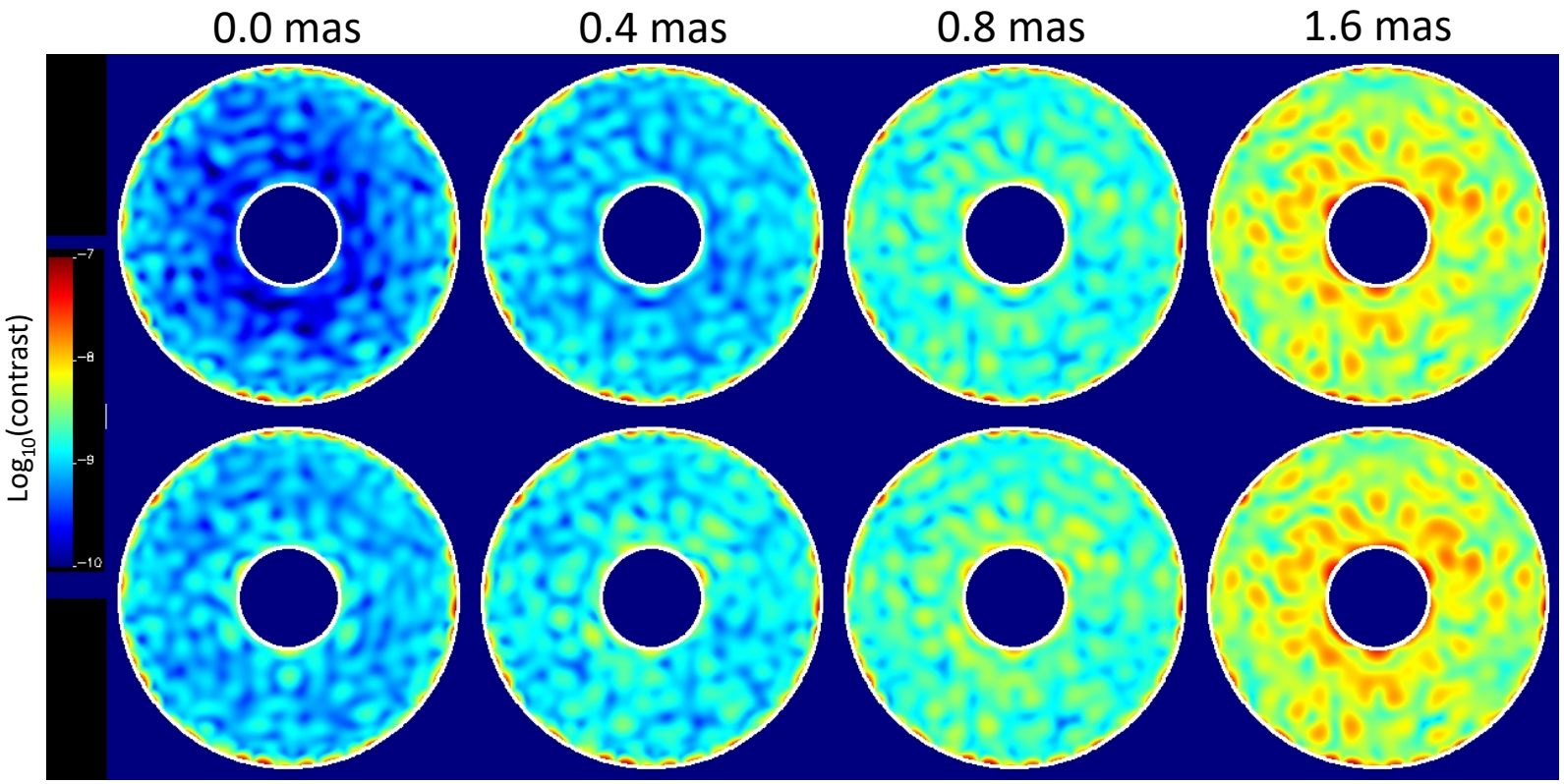
HLC 20180925 (10%, λ_c=575 nm)

Each result is after running EFC; no jitter



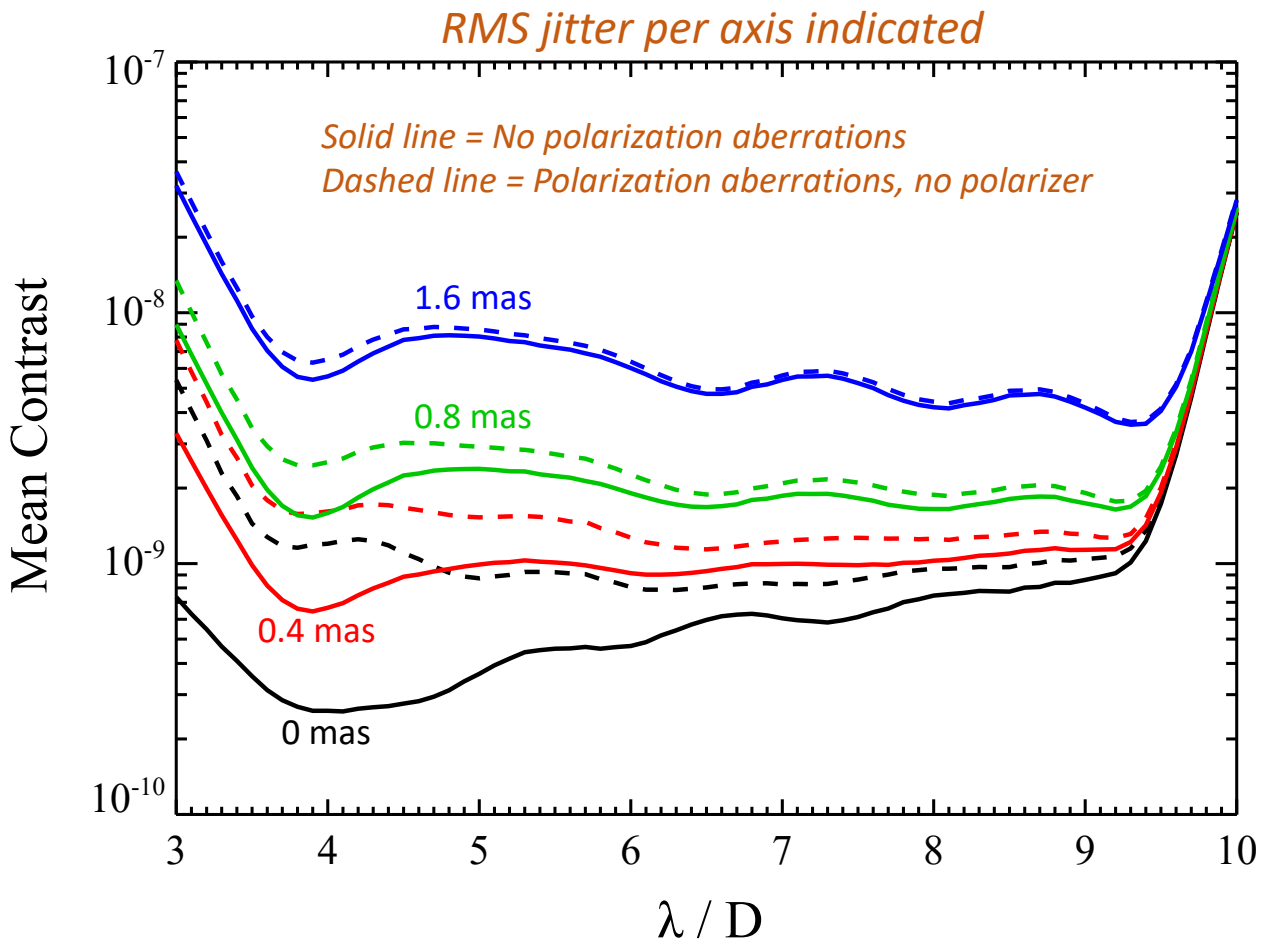
HLC 20180925 (10%, λ_c=575 nm)

Each result is after running EFC; with jitter



HLC 20180925 (10%, λ_c=575 nm)

Each result is after running EFC; with jitter



Conclusions

- In the absence of any other factors, the difference in a polarizer-free system between perfectly-polarization-compensated contrast and uncompensated contrast is only significant out to ~5 λ/D and is dependent on the unlikely ability to achieve as deep a contrast in real life as the models predict (not shown in the testbed)
- In the presences of other factors, notably jitter, the difference between these states quickly becomes negligible
- The application of modeling uncertainty factors does not alter these findings, since polarization aberration effects and jitter both would increase, and a significant uncertainty factor would need to be applied to the compensator
- The conclusion is that a polarization compensator in WFIRST CGI is not warranted